

Kansas Department of Health and Environment
Proposed Amended Regulation

Article 16. - SURFACE WATER QUALITY STANDARDS

28-16-28e. Surface water quality criteria. (a) Criteria development guidance. The development of surface water quality criteria for substances not listed in these standards shall be guided by water quality criteria published by the United States environmental protection agency. If the department finds that the criteria listed in this regulation are underprotective or overprotective for a given surface water segment, appropriate site-specific criteria may be developed and applied by the department, in accordance with K.A.R. 28-16-28f (f), using bioassessment methods or other related scientific procedures, including those procedures consistent with the United States environmental protection agency's "water quality standards handbook," second edition, as published in August 1994 or other department-approved methods.

(b) General criteria for surface waters. The following criteria shall apply to all surface waters, regardless of classification.

(1) Surface waters shall be free, at all times, from the harmful effects of substances that originate from artificial sources of pollution and that produce any public health hazard, nuisance condition, or impairment of a designated use.

(2) Hazardous materials derived from artificial sources, including toxic substances, radioactive isotopes, and infectious microorganisms derived directly or indirectly from point or nonpoint sources, shall not occur in surface waters at concentrations or in combinations that jeopardize the public

health or the survival or well-being of livestock, domestic animals, terrestrial wildlife, or aquatic or semiaquatic life.

(3) Surface waters shall be free of all discarded solid materials, including trash, garbage, rubbish, offal, grass clippings, discarded building or construction materials, car bodies, tires, wire, and other unwanted or discarded materials. The placement of stone and concrete rubble for bank stabilization shall be acceptable to the department, if all other required permits are obtained before placement.

(4) Surface waters shall be free of floating debris, scum, foam, froth, and other floating materials directly or indirectly attributable to artificial sources of pollution.

(5) Oil and grease from artificial sources shall not cause any visible film or sheen to form upon the surface of the water or upon submerged substrate or adjoining shorelines, nor shall these materials cause a sludge or emulsion to be deposited beneath the surface of the water or upon the adjoining shorelines.

(6) Surface waters shall be free of deposits of sludge or fine solids attributable to artificial sources of pollution.

(7) Taste-producing and odor-producing substances of artificial origin shall not occur in surface waters at concentrations that interfere with the production of potable water by conventional water treatment processes, that impart an unpalatable flavor to edible aquatic or semiaquatic life or terrestrial wildlife, or that result in noticeable odors in the vicinity of surface waters.

(8) The natural appearance of surface waters shall not be altered by the addition of color-

producing or turbidity-producing substances of artificial origin.

(9) In stream segments where background concentrations of naturally occurring substances, including chlorides and sulfates, exceed the water quality criteria listed in table 1a of subsection (d), at ambient flow, the existing water quality shall be maintained, and the newly established numeric criteria shall be the background concentration, as defined in K.A.R. 28-16-28b(e). Background concentrations shall be established using the methods outlined in the “Kansas implementation procedures: surface water quality standards,” as defined in K.A.R. 28-16-28b(ee), and available upon request from the department.

(c) Criteria for designated uses of surface waters. The numeric criteria in tables 1a, 1b, 1c, 1d, and 1e shall not apply if the critical low flow is less than 0.03 cubic meters per second for waters designated as expected aquatic life use waters and restricted aquatic life use waters, unless studies conducted or approved by the department show that water present during periods of no flow, or flow below critical low flow, provides important refuges for aquatic life and permits biological recolonization of intermittently flowing segments. The numeric criteria in tables 1a, 1b, 1c, 1d, and 1e shall not apply if the critical low flow is less than 0.003 cubic meters per second for waters designated as special aquatic life use waters, unless studies conducted or approved by the department show that water present during periods of no flow, or flow below critical low flow, provides important refuges for aquatic life and permits biological recolonization of intermittently flowing segments. The following criteria shall apply to all classified surface waters for the indicated designated uses.

(1) Agricultural water supply use. The water quality criteria for irrigation and livestock

watering set forth in table 1a in subsection (d) shall not be exceeded outside of mixing zones due to artificial sources of pollution.

(2) Aquatic life support use.

(A) Dissolved oxygen. The concentration of dissolved oxygen in surface waters shall not be lowered below 5.0 mg/L by the influence of artificial sources of pollution.

(B) Nutrients. The introduction of plant nutrients into streams, lakes, or wetlands from artificial sources shall be controlled to prevent the accelerated succession or replacement of aquatic biota or the production of undesirable quantities or kinds of aquatic life.

(C) pH. Artificial sources of pollution shall not cause the pH of any surface water outside of a zone of initial dilution to be below 6.5 or above 8.5.

(D) Suspended solids. Suspended solids added to surface waters by artificial sources shall not interfere with the behavior, reproduction, physical habitat, or other factors related to the survival and propagation of aquatic or semiaquatic life or terrestrial wildlife. In the application of this provision, suspended solids associated with discharges of presedimentation sludge from water treatment facilities shall be deemed noninjurious to aquatic and semiaquatic life and terrestrial wildlife, if these discharges comply fully with the requirements of paragraphs (b)(6) and (8) and paragraph (c)(2)(F).

(E) Temperature.

(i) Except as provided in paragraph (c)(2)(E)(ii), a discharge shall not elevate the temperature of a receiving surface water beyond the zone of initial dilution above 32° C (90° F).

Heat of artificial origin shall not be added to a surface water in excess of the amount that will raise

the temperature of the water beyond the mixing zone more than 3° C above natural conditions.

Additionally, a discharge to a receiving water shall not lower the temperature of the water beyond the mixing zone more than 3° C below natural conditions. The normal daily and seasonal temperature variations occurring within a surface water before the addition of heated or cooled water of artificial origin shall be maintained.

(ii) Temperature criteria applicable to industrial cooling water recycling reservoirs that meet the requirements for classification specified in K.A.R. 28-16-28d(c)(2) shall be established by the ~~department~~ secretary on a case-by-case basis to protect the public health, safety, or the environment.

(F) Toxic substances.

(i) Conditions of acute toxicity shall not occur in classified surface waters outside of zones of initial dilution, nor shall conditions of chronic toxicity occur in classified surface waters outside of mixing zones.

(ii) Acute criteria for the aquatic life support use specified in tables 1a, 1b, and 1c in subsection (d) shall apply beyond the zone of initial dilution. Chronic criteria for the aquatic life support use given in tables 1a, 1b, 1d, and 1e in subsection (d) shall apply beyond the mixing zone.

(iii) If a discharge contains a toxic substance that lacks any published criteria for the aquatic life support use, or if a discharge contains a mixture of toxic substances capable of additive or synergistic interactions, bioassessment methods and procedures shall be specified by the department to establish whole-effluent toxicity limitations that are consistent with paragraph (2)(F)(i) of this

subsection.

(3) Domestic water supply use.

(A) Except as provided in paragraph (c)(3)(B), criteria listed in table 1a in subsection (d) for domestic water supply use shall not be exceeded at any point of domestic water supply diversion.

(B) In stream segments where background concentrations of naturally occurring substances, including chlorides and sulfates, exceed the domestic water supply criteria listed in table 1a in subsection (d), at ambient flow, due to intrusion of mineralized groundwater, the existing water quality shall be maintained, and the newly established numeric criteria for domestic water supply shall be the background concentration, as defined in K.A.R. 28-16-28b(e). Background concentrations shall be established using the methods outlined in the “Kansas implementation procedures: surface water quality standards,” as defined in K.A.R. 28-16-28b(ee), available upon request from the department.

(C) Any substance derived from an artificial source that, alone or in combination with other synthetic or naturally occurring substances, causes toxic, carcinogenic, teratogenic, or mutagenic effects in humans shall be limited to nonharmful concentrations in surface waters. Unless site-specific water quality conditions warrant the promulgation of more protective criteria under the provisions of subsection (a) and K.A.R. 28-16-28f(f), maximum contaminant levels for toxic, carcinogenic, teratogenic, or mutagenic substances promulgated by the United States environmental protection agency pursuant to section 300g-1 of the federal safe drinking water act, 42 U.S.C. 300f through 300j-9, as amended on August 6, 1996, shall be deemed nonharmful by the department and adopted as

domestic water supply criteria.

(4) Food procurement use.

(A) Criteria listed in table 1a in subsection (d) for food procurement use shall not be exceeded outside of a mixing zone due to any artificial source of pollution.

(B) Substances that can bioaccumulate in the tissues of edible aquatic or semiaquatic life or wildlife through bioconcentration or biomagnification shall be limited in surface waters to concentrations that result in no harm to human consumers of these tissues. For bioaccumulative carcinogens, surface water concentrations corresponding to a cancer risk level of less than 0.000001 (10^{-6}) in human consumers of aquatic or semiaquatic life or wildlife shall be deemed nonharmful by the department and adopted as food procurement criteria. Average rates of tissue consumption and lifetime exposure shall be assumed by the department in the estimation of the cancer risk level.

(5) Groundwater recharge use. In surface waters designated for the groundwater recharge use, water quality shall be such that, at a minimum, degradation of groundwater quality does not occur. Degradation shall include any statistically significant increase in the concentration of any chemical or radiological contaminant or infectious microorganism in groundwater resulting from surface water infiltration or injection.

(6) Industrial water supply use. Surface water quality criteria for industrial water supplies shall be determined by the ~~department~~ secretary on a case-by-case basis to protect the public health, safety, or the environment.

(7) Recreational use.

(A) General. The introduction of plant nutrients into surface waters designated for primary or secondary contact recreational use shall be controlled to prevent the development of objectionable concentrations of algae or algal by-products or nuisance growths of submersed, floating, or emergent aquatic vegetation.

(B) Primary contact recreation for surface waters other than stream segments.

Artificial sources of pollution shall not cause concentrations of fecal coliform bacteria in surface waters other than stream segments designated for primary contact recreational use to exceed a geometric mean of 200 organisms per 100 milliliters beyond the mixing zone.

Calculation of the geometric mean shall be based on the analysis of at least five consecutive samples collected during separate 24-hour periods within a 30-day period. These criteria shall be in effect from April 1 through October 31 of each year. The concentration of fecal coliform bacteria in surface waters other than stream segments designated for primary contact recreation shall not exceed 2,000 organisms per 100 milliliters beyond the mixing zone, from November 1 through March 31 of each year.

(C) Secondary contact recreation for surface waters other than stream segments.

Artificial sources of pollution shall not cause concentrations of fecal coliform bacteria in surface waters other than stream segments designated for secondary contact recreational use to exceed 2,000 organisms per 100 milliliters beyond the mixing zone. This criterion shall be in effect from January 1 through December 31 of each year.

(D) Primary contact recreation for classified stream segments. At least five samples

shall be collected during separate 24-hour periods within a 30-day period. A geometric mean analysis of these samples shall meet the following criteria:

(i) Primary contact recreational use: class A. Artificial sources of pollution shall not cause concentrations of *Escherichia coli* bacteria to exceed a geometric mean of 160 colony-forming units (cfu) per 100 milliliters beyond the mixing zone from April 1 through October 31 of each year. The concentration of *Escherichia coli* bacteria shall not exceed a geometric mean of 2,358 colony-forming units (cfu) per 100 milliliters beyond the mixing zone from November 1 through March 31 of each year.

(ii) Primary contact recreational use: class B. Artificial sources of pollution shall not cause concentrations of *Escherichia coli* bacteria to exceed a geometric mean of 262 colony-forming units (cfu) per 100 milliliters beyond the mixing zone from April 1 through October 31 of each year. The concentration of *Escherichia coli* bacteria shall not exceed a geometric mean of 2,358 colony-forming units (cfu) per 100 milliliters beyond the mixing zone from November 1 through March 31 of each year.

(iii) Primary contact recreational use: class C. Artificial sources of pollution shall not cause concentrations of *Escherichia coli* bacteria to exceed a geometric mean of 427 colony-forming units (cfu) per 100 milliliters beyond the mixing zone from April 1 through October 31 of each year. The concentration of *Escherichia coli* bacteria shall not exceed a geometric mean of 3,843 colony-forming units (cfu) per 100 milliliters beyond the mixing zone from November 1 through March 31 of each year.

(E) Secondary contact recreation for stream segments. The following criteria shall be in effect from January 1 through December 31 of each year. At least five samples shall be collected during separate 24-hour periods within a 30-day period. A geometric mean analysis of these samples shall meet the following criteria:

(i) Secondary contact recreational use: class A. Artificial sources of pollution shall not cause concentrations of *Escherichia coli* bacteria to exceed a geometric mean of 2,358 colony-forming units per 100 milliliters beyond the mixing zone.

(ii) Secondary contact recreational use: class B. Artificial sources of pollution shall not cause concentrations of *Escherichia coli* bacteria to exceed a geometric mean of 3,843 colony-forming units per 100 milliliters beyond the mixing zone.

(F) Wastewater effluent shall be disinfected if it is determined by the department that the discharge of nondisinfected wastewater constitutes an actual or potential threat to public health. Situations that constitute an actual or potential threat to public health shall include instances in which there is a reasonable potential for the discharge to exceed the applicable criteria supporting the assigned recreational use designation or if a water body is known or likely to be used for either of the following:

(i) Primary or secondary contact recreation; or

(ii) any domestic water supply.

(8) Multiple uses. If a classified surface water or surface water segment is designated for more than one designated use according to K.A.R. 28-16-28d(d), the water quality of the surface

water or surface water segment shall comply with the most stringent of the applicable water quality criteria.

(d) Tables.

Table 1a. Numeric criteria.

PARAMETER	Use Category					
	AQUATIC LIFE		AGRICULTURE		PUBLIC HEALTH	
	ACUTE	CHRONIC	LIVESTOCK	IRRIGATION	FOOD PROCUREMENT	DOMESTIC WATER SUPPLY
RADIONUCLIDES (pCi/L)						
gross beta radioactivity	a	a	a	a	a	50
gross alpha particles including radium-226, but not radon or uranium	a	a	a	a	a	15
radium 226 and 228 combined	a	a	a	a	a	5
strontium 90	a	a	a	a	a	8
tritium	a	a	a	a	a	20,000
METALS (µg/L)						
antimony, total	88	30	a	a	4,300	6
arsenic, total	340	50	200	100	20.5	b
arsenic (III)	360	50	a	a	b	b
arsenic (V)	850	48	a	a	a	a
barium	a	a	a	a	a	2,000
beryllium, total	130	5.3	a	100	0.13	4
boron, total	a	a	5,000	750	a	a
cadmium, total	table 1b	table 1b	20	10	170	5
chromium, total	a	40	1,000	100	a	100
chromium (III)	table 1b	table 1b	a	a	3,433,000	50
chromium (VI)	15	10	a	a	3,400	50
copper, total	table 1b	table 1b	500	200	a	1,300
lead, total	table 1b	table 1b	100	5,000	a	15
mercury, total	2.1	0.012	10	a	0.146	b
nickel, total	table 1b	table 1b	500	200	100	100
selenium, total	20	5	50	20	6,800	50
selenium (V)	11.2	a	a	a	a	a
silver, total	table 1b	a	a	a	a	50
thallium, total	1,400	40	a	a	b	2
zinc, total	table 1b	table 1b	25,000	2,000	a	a
OTHER INORGANIC SUBSTANCES (µg/L)						
ammonia	table 1c	table 1c	a	a	a	a
asbestos (µfibers/L)	a	a	a	a	a	7,000,000
chloride	860,000	c	a	a	a	250,000
chlorine, total residual	19	11	a	a	a	a
cyanide (free)	22	5.2	a	a	220,000	200
fluoride	a	a	2,000	1,000	a	2,000
nitrate (as N)	a	a	a	a	a	10,000
nitrite + nitrate (as N)	a	a	100,000	a	a	10,000
phosphorus, elemental (white)	a	0.1	a	a	a	a
sulfate	a	a	1,000,000	a	a	250,000

Table 1a. Numeric criteria (continued).

PARAMETER	Use Category					
	AQUATIC LIFE		AGRICULTURE		PUBLIC HEALTH	
	ACUTE	CHRONIC	LIVESTOCK	IRRIGATION	FOOD PROCUREMENT	DOMESTIC WATER SUPPLY
ORGANIC SUBSTANCES (µG/L)						
Benzenes.....						
aminobenzene (aniline)	14	6.7	a	a	a	a
benzene	5,300	a	a	a	40	b
chlorobenzene	250	50	a	a	21,000	100
dichlorobenzenes, total	1,120	763	a	a	2,600	a
o-dichlorobenzene	1,120	763	a	a	2,600	600
m-dichlorobenzene	1,120	763	a	a	2,600	b
p-dichlorobenzene	a	a	a	a	2,600	75
other chlorinated benzenes, total	250	50	a	a	a	a
1,2,4-trichlorobenzene	250	a	a	a	940	70
1,2,4,5-tetrachlorobenzene	250	50	a	a	48	a
pentachlorobenzene	250	50	a	a	85	a
hexachlorobenzene	6.0	3.7	a	a	0.00074	b
ethylbenzene	32,000	a	a	a	28,718	700
nitrobenzene	27,000	a	a	a	1,900	b
pentachloronitrobenzene	250	50	a	a	a	a
vinylbenzene (styrene)	a	a	a	a	a	100
Ethers.....						
chloroalkyl ethers, total	238,000	a	a	a	a	a
bis(2-chloroethyl)ether	238,000	a	a	a	1.36	b
bis(2-chloroisopropyl)ether	238,000	a	a	a	0.00184	b
bis(chloromethyl)ether	238,000	a	a	a	0.00184	a
2-chloroethyl vinyl ether	360	120	a	a	a	a
halogenated ethers, total	360	122	a	a	a	a
chloromethyl methyl ether	238,000	a	a	a	0.00184	a
4,4'-dibromodiphenyl ether	360	120	a	a	a	a
hexabromodiphenyl ether	360	120	a	a	a	a
nonabromodiphenyl ether	360	120	a	a	a	a
pentabromodiphenyl ether	360	120	a	a	a	a
tetrabromodiphenyl ether	360	120	a	a	a	a
tribromodiphenyl ether	360	120	a	a	a	a
Halogenated Hydrocarbons.....						
chlorinated ethanes						
1,2-dichloroethane	18,000	2,000	a	a	b	b
1,1,1-trichloroethane	18,000	a	a	a	173,077	200
1,1,2-trichloroethane	18,000	9,400	a	a	41.8	b
tetrachloroethanes, total	9,320	a	a	a	a	a
1,1,1,2-tetrachloroethane	9,320	a	a	a	a	a
1,1,2,2-tetrachloroethane	9,320	2,400	a	a	10.7	b
pentachloroethane	7,240	1,100	a	a	a	a
hexachloroethane	980	540	a	a	8.74	b
chlorinated ethylenes, total						
1,1-dichloroethylene	11,600	a	a	a	1.85	b
cis-1,2-dichloroethylene	11,600	a	a	a	1.85	70
trans-1,2-dichloroethylene	11,600	a	a	a	140,000	100
trichloroethylene	45,000	21,900	a	a	80.7	b
tetrachloroethylene	5,280	840	a	a	8.85	b

Table 1a. Numeric criteria (continued).

PARAMETER	Use Category					
	AQUATIC LIFE		AGRICULTURE		PUBLIC HEALTH	
	ACUTE	CHRONIC	LIVESTOCK	IRRIGATION	FOOD PROCUREMENT	DOMESTIC WATER SUPPLY
chlorinated propanes/propenes						
1,2-dichloropropane	23,000	5,700	9.0	a	39	5
1,3-dichloropropene	6,600	244	a	a	14.1	b
Other Halogenated Hydrocarbons.....						
halogenated methanes, total	11,000	a	a	a	15.7	100
bromomethane	11,000	a	a	a	15.7	b
1,2-dibromoethane	a	a	a	a	a	0.05
tribromomethane (bromoform)	11,000	a	a	a	15.7	b
bis(2-chloroethoxy)methane	11,000	a	a	a	15.7	a
bromodichloromethane	11,000	a	a	a	15.7	b
bromochloromethane	11,000	a	a	a	15.7	a
bromotrichloromethane	11,000	a	a	a	15.7	a
dibromochloromethane	11,000	a	a	a	15.7	b
dibromochloropropane	a	a	a	a	15.7	0.2
dibromodichloromethane	11,000	a	a	a	15.7	a
dichlorodifluoromethane	11,000	a	a	a	15.7	a
dichloromethane (methylene chloride)	11,000	a	a	a	1,600	4.7
trichloromethane (chloroform)	28,900	1,240	a	a	15.7	b
tribromochloromethane	11,000	a	a	a	15.7	a
trichlorofluoromethane	11,000	a	a	a	15.7	a
tetrachloromethane (carbon tetrachloride)	35,200	a	a	a	b	b
di(2-ethylhexyl) adipate	a	a	a	a	a	500
hexachlorobutadiene	90	9.3	a	a	50	b
hexachlorocyclopentadiene	7	5.2	a	a	206	50
vinyl chloride	a	a	a	a	525	2
Miscellaneous Organics.....						
dioxin (2,3,7,8 TCDD)	0.01	0.00001	a	a	0.000000014	b
isosporone	117,000	a	a	a	b	b
polychlorinated biphenyls, total	2	0.014	a	a	0.0000079	b
tributyltin oxide	0.149	0.026	a	a	a	a
Nitrogen Compounds.....						
nitrosamines, total	5,850	a	a	a	1.24	a
N-nitrosodibutylamine	5,850	a	a	a	0.587	a
N-nitrosodiethanolamine	5,850	a	a	a	1.24	a
N-nitrosodiethylamine	5,850	a	a	a	1.24	a
N-nitrosodimethylamine	5,850	a	a	a	1.6	b
N-nitrosodiphenylamine	5,850	a	a	a	16.0	b
N-nitrosodi-n-propylamine	a	a	a	a	1.24	.005
N-nitrosopyrrolidine	5,850	a	a	a	91.9	a
acrylonitrile	7,550	2,600	a	a	0.65	b
benzidine	2,500	a	a	a	0.000535	b
3,3'-dichlorobenzidine	a	a	a	a	0.02	b
1,2-diphenyl hydrazine	270	a	a	a	0.54	b
Polynuclear Aromatic Hydrocarbons, total	a	a	a	a	0.0311	0.2
acenaphthene	1,700	520	a	a	2,700	1200
acenaphthylene	a	a	a	a	0.0311	a
anthracene	a	a	a	a	0.0311	b
benzo(a)anthracene	a	a	a	a	0.0311	b

Table 1a. Numeric criteria (continued).

PARAMETER	Use Category					
	AQUATIC LIFE		AGRICULTURE		PUBLIC HEALTH	
	ACUTE	CHRONIC	LIVESTOCK	IRRIGATION	FOOD PROCUREMENT	DOMESTIC WATER SUPPLY
benzo(a)pyrene	a	a	a	a	0.0311	b
benzo(b)fluoranthene	a	a	a	a	0.0311	b
benzo(g,h,i)perylene	a	a	a	a	0.0311	a
benzo(k)fluoranthene	a	a	a	a	0.0311	b
2-chloronaphthalene	a	a	a	a	4,300	1,700
chrysene	a	a	a	a	0.0311	b
dibenzo(a,h)anthracene	a	a	a	a	0.0311	b
fluoranthene	3,980	a	a	a	b	b
fluorene	a	a	a	a	0.0311	b
ideno(1,2,3-cd)pyrene	a	a	a	a	0.0311	b
naphthalene	2,300	620	a	a	a	a
phenanthrene	30	6.3	a	a	0.0311	a
pyrene	a	a	a	a	0.0311	b
Phthalate Esters						
phthalates, total	940	3	a	a	a	a
butylbenzyl phthalate	a	a	a	a	5,200	100
di(2-ethylhexyl) phthalate	400	360	a	a	b	b
dibutyl phthalate	940	3	a	a	b	b
diethyl phthalate	a	a	a	a	b	5
dimethyl phthalate	940	3	a	a	2,900,000	b
Phenolic Compounds.....						
phenol	10,200	2,560	a	a	4,600,000	b
2,4-dimethyl phenol	1,300	530	a	a	2,300	540
chlorinated phenols						
2-chlorophenol	4,380	2,000	a	a	400	120
3-chlorophenol	a	a	a	a	29,000	a
2,4-dichlorophenol	2,020	365	a	a	b	b
2,4,5-trichlorophenol	100	63	a	a	a	a
2,4,6-trichlorophenol	a	970	a	a	3.6	b
pentachlorophenol	table 1b	table 1b	a	a	8.2	b
3-methyl-4-chlorophenol	30	a	a	a	a	a
nitrophenols, total	230	150	a	a	a	a
2,4-dinitrophenol	a	a	a	a	765	b
4,6-dinitro-o-cresol	a	a	a	a	765	b
Toluenes.....						
toluene	17,500	a	a	a	b	1,000
dinitrotoluenes, total	330	230	a	a	9.1	a
2,4-dinitrotoluene	330	230	a	a	9.1	b
xylene	a	a	a	a	a	10,000
PESTICIDES (µg/L)						
acrolein	68	21	a	a	780	320
acrylamide	a	a	a	a	a	0.01
alachlor (lasso)	760	76	100	a	a	2
aldicarb	a	a	a	a	a	3
aldicarb sulfone	a	a	a	a	a	2
aldicarb sulfoxide	a	a	a	a	a	3
aldrin	3	0.001	1	a	0.000079	b
atrazine (aatrex)	170	3	a	a	a	3
bromoxynil (MCPA)	a	a	20	a	a	a

Table 1a. Numeric criteria (continued).

PARAMETER	Use Category					
	AQUATIC LIFE		AGRICULTURE		PUBLIC HEALTH	
	ACUTE	CHRONIC	LIVESTOCK	IRRIGATION	FOOD PROCUREMENT	DOMESTIC WATER SUPPLY
carbaryl (sevin)	a	0.02	100	a	a	a
carbofuran (furadan)	a	a	100	a	a	40
chlordane	2.4	0.0043	3	a	0.00048	b
chlorpyrifos	0.083	0.041	100	a	a	a
2,4-D	a	a	a	a	a	70
dacthal (DCPA)	a	14,300	a	a	a	a
dalapon	a	110	a	a	a	200
diazinon (spectracide)	a	0.08	100	a	a	a
DDT and Metabolites.....						
4,4'-DDE (p,p'-DDE)	1,050	a	a	a	0.00059	b
4,4'-DDD (p,p'-DDD)	a	a	a	a	0.00084	b
DDT, total	1.1	0.001	50	a	0.000024	b
dieldrin	1.0	0.0019	1	a	0.000076	b
dinoseb (DNBP)	a	a	a	a	a	7
diquat	a	a	a	a	a	20
disulfoton (disyston)	a	a	100	a	a	a
endosulfan, total	0.22	0.056	a	a	159	b
alpha-endosulfan	0.22	0.056	a	a	240	110
beta-endosulfan	0.22	0.056	a	a	240	110
endosulfan sulfate	a	a	a	a	b	b
endothall	a	a	a	a	a	110
endrin	0.18	0.0023	0.5	a	0.81	0.76
endrin aldehyde	a	a	a	a	0.81	b
epichlorohydrin	a	a	a	a	a	4
ethylene dibromide	a	a	a	a	a	0.05
fenchlorfos (ronnel)	a	a	100	a	a	a
glyphosate (roundup)	a	a	a	a	a	700
guthion	a	0.010	100	a	a	a
heptachlor	0.52	0.0038	0.1	a	0.00021	b
heptachlor epoxide	0.52	0.0038	0.1	a	b	b
hexachlorocyclohexane	100	a	a	a	a	a
alpha-HCH	100	a	a	a	0.0031	b
beta-HCH	100	a	a	a	b	b
delta-HCH	100	a	a	a	a	a
gamma-HCH (lindane)	2	0.08	5	a	0.0625	b
technical-HCH	a	a	a	a	0.0414	a
malathion	a	0.10	100	a	a	a
methoxychlor	a	0.03	1,000	a	a	40
methyl parathion	a	a	100	a	a	a
metribuzin (sencor)	a	100	a	a	a	a
mirex	a	0.001	a	a	0.000097	a
oxamyl (vydate)	a	a	a	a	a	200
parathion	0.065	0.013	100	a	a	a
picloram (tordon)	a	a	a	a	a	500
propachlor (ramrod)	a	8	a	a	a	a
simazine (princep)	a	a	10	a	a	4
toxaphene	0.73	0.0002	5	a	0.00073	b
2,4,5-T	a	a	2	a	a	a
2,4,5-TP (silvex)	a	a	a	a	a	50

a - criterion not available

b - US EPA has promulgated criterion for Kansas under the Code of Federal Regulations, Title 40, part 131.36

c - criterion under investigation

Table 1b. Formulae for calculation of hardness-dependent aquatic life support criteria for chromium III and total cadmium, total copper, total lead, total nickel, total silver and total zinc and pH-dependent aquatic life support criteria for pentachlorophenol. A WER value of 1.0 is applied in the hardness-dependent equations for total metals unless a site-specific WER has been determined and adopted by the department in accordance with K.A.R. 28-16-28e(a) and K.A.R. 28-16-28f(f). Hardness values in metal formulae are entered in units of mg/L as CaCO₃. Pentachlorophenol formulae apply only over the pH range 6.5-8.5.

CADMIUM (ug/L):

$$\text{acute criterion} = \text{WER}[\text{EXP}[(1.1280 * (\text{LN}(\text{hardness}))) - 3.6867]]$$

$$\text{chronic criterion} = \text{WER}[\text{EXP}[(0.7852 * (\text{LN}(\text{hardness}))) - 2.715]]$$

CHROMIUM III (ug/L):

$$\text{acute criterion} = \text{WER}[\text{EXP}[(0.819 * (\text{LN}(\text{hardness}))) + 3.7256]]$$

$$\text{chronic criterion} = \text{WER}[\text{EXP}[(0.819 * (\text{LN}(\text{hardness}))) + 0.6848]]$$

COPPER (ug/L):

$$\text{acute criterion} = \text{WER}[\text{EXP}[(0.9422 * (\text{LN}(\text{hardness}))) - 1.700]]$$

$$\text{chronic criterion} = \text{WER}[\text{EXP}[(0.8545 * (\text{LN}(\text{hardness}))) - 1.702]]$$

LEAD (ug/L):

$$\text{acute criterion} = \text{WER}[\text{EXP}[(1.273 * (\text{LN}(\text{hardness}))) - 1.460]]$$

$$\text{chronic criterion} = \text{WER}[\text{EXP}[(1.273 * (\text{LN}(\text{hardness}))) - 4.705]]$$

NICKEL (ug/L):

$$\text{acute criterion} = \text{WER}[\text{EXP}[(0.846 * (\text{LN}(\text{hardness}))) + 2.255]]$$

$$\text{chronic criterion} = \text{WER}[\text{EXP}[(0.846 * (\text{LN}(\text{hardness}))) + 0.0584]]$$

PENTACHLOROPHENOL (ug/L):

$$\text{acute criterion} = \text{EXP}[(1.005 * \text{pH}) - 4.830]$$

$$\text{chronic criterion} = \text{EXP}[(1.005 * \text{pH}) - 5.290]$$

SILVER (ug/L):

$$\text{acute criterion} = \text{WER}[\text{EXP}[(1.72 * (\text{LN}(\text{hardness}))) - 6.52]]$$

ZINC (ug/L):

$$\text{acute criterion} = \text{WER}[\text{EXP}[(0.8473 * (\text{LN}(\text{hardness}))) + 0.884]]$$

$$\text{chronic criterion} = \text{WER}[\text{EXP}[(0.8473 * (\text{LN}(\text{hardness}))) + 0.884]]$$

Table 1c. pH-dependent acute aquatic life criteria for total ammonia (total ammonia as N, mg/L).

Acute Aquatic Life Criteria for Ammonia, mg/L	
pH	Criteria
6.5	48.8
6.6	46.8
6.7	44.6
6.8	42.0
6.9	39.1
7.0	36.1
7.1	32.8
7.2	29.5
7.3	26.2
7.4	23.0
7.5	19.9
7.6	17.0
7.7	14.4
7.8	12.1
7.9	10.1
8.0	8.40
8.1	6.95
8.2	5.72
8.3	4.71
8.4	3.88
8.5	3.20
8.6	2.65
8.7	2.20
8.8	1.84
8.9	1.56
9.0	1.32

Table 1d. pH- and temperature-dependent chronic aquatic life criteria for total ammonia (total ammonia as N, mg/L) with early life stages of fish present.

Chronic Aquatic Life Criteria for Ammonia, Early Life Stages Present, mg/L										
pH	Temperature, °C									
	0	14	16	18	20	22	24	26	28	30
6.5	6.67	6.67	6.06	5.33	4.68	4.12	3.62	3.18	2.80	2.46
6.6	6.57	6.57	5.97	5.25	4.61	4.05	3.56	3.13	2.75	2.42
6.7	6.44	6.44	5.86	5.15	4.52	3.98	3.50	3.07	2.70	2.37
6.8	6.29	6.29	5.72	5.03	4.42	3.89	3.42	3.00	2.64	2.32
6.9	6.12	6.12	5.56	4.89	4.30	3.78	3.32	2.92	2.57	2.25
7.0	5.91	5.91	5.37	4.72	4.15	3.65	3.21	2.82	2.48	2.18
7.1	5.67	5.67	5.15	4.53	3.98	3.50	3.08	2.70	2.38	2.09
7.2	5.39	5.39	4.90	4.31	3.78	3.33	2.92	2.57	2.26	1.99
7.3	5.08	5.08	4.61	4.06	3.57	3.13	2.76	2.42	2.13	1.87
7.4	4.73	4.73	4.30	3.78	3.32	2.92	2.57	2.26	1.98	1.74
7.5	4.36	4.36	3.97	3.49	3.06	2.69	2.37	2.08	1.83	1.61
7.6	3.98	3.98	3.61	3.18	2.79	2.45	2.16	1.90	1.67	1.47
7.7	3.58	3.58	3.25	2.86	2.51	2.21	1.94	1.71	1.50	1.32
7.8	3.18	3.18	2.89	2.54	2.23	1.96	1.73	1.52	1.33	1.17
7.9	2.80	2.80	2.54	2.24	1.96	1.73	1.52	1.33	1.17	1.03
8.0	2.43	2.43	2.21	1.94	1.71	1.50	1.32	1.16	1.02	0.897
8.1	2.10	2.10	1.91	1.68	1.47	1.29	1.14	1.00	0.879	0.773
8.2	1.79	1.79	1.63	1.43	1.26	1.11	0.973	0.855	0.752	0.661
8.3	1.52	1.52	1.39	1.22	1.07	0.941	0.827	0.727	0.639	0.562
8.4	1.29	1.29	1.17	1.03	0.906	0.796	0.700	0.615	0.541	0.475
8.5	1.09	1.09	0.990	0.870	0.765	0.672	0.591	0.520	0.457	0.401
8.6	0.920	0.920	0.836	0.735	0.646	0.568	0.499	0.439	0.386	0.339
8.7	0.778	0.778	0.707	0.622	0.547	0.480	0.422	0.371	0.326	0.287
8.8	0.661	0.661	0.601	0.528	0.464	0.408	0.359	0.315	0.277	0.244
8.9	0.565	0.565	0.513	0.451	0.397	0.349	0.306	0.269	0.237	0.208
9.0	0.486	0.486	0.442	0.389	0.342	0.300	0.264	0.232	0.204	0.179

Table 1e. pH- and temperature-dependent chronic aquatic life criteria for total ammonia (total ammonia as N, mg/L) with early life stages of fish absent.

Chronic Aquatic Life Criteria for Ammonia, Early Life Stages Absent*, mg/L								
pH	Temperature, °C							
	0-7	8	9	10	11	12	13	14**
6.5	10.8	10.1	9.51	8.92	8.36	7.84	7.35	6.89
6.6	10.7	9.99	9.37	8.79	8.24	7.72	7.24	6.79
6.7	10.5	9.81	9.20	8.62	8.08	7.58	7.11	6.66
6.8	10.2	9.58	8.98	8.42	7.90	7.40	6.94	6.51
6.9	9.93	9.31	8.73	8.19	7.68	7.20	6.75	6.33
7.0	9.60	9.00	8.43	7.91	7.41	6.95	6.52	6.11
7.1	9.20	8.63	8.09	7.58	7.11	6.67	6.25	5.86
7.2	8.75	8.20	7.69	7.21	6.76	6.34	5.94	5.57
7.3	8.24	7.73	7.25	6.79	6.37	5.97	5.60	5.25
7.4	7.69	7.21	6.76	6.33	5.94	5.57	5.22	4.89
7.5	7.09	6.64	6.23	5.84	5.48	5.13	4.81	4.51
7.6	6.46	6.05	5.67	5.32	4.99	4.68	4.38	4.11
7.7	5.81	5.45	5.11	4.79	4.49	4.21	3.95	3.70
7.8	5.17	4.84	4.54	4.26	3.99	3.74	3.51	3.29
7.9	4.54	4.26	3.99	3.74	3.51	3.29	3.09	2.89
8.0	3.95	3.70	3.47	3.26	3.05	2.86	2.68	2.52
8.1	3.41	3.19	2.99	2.81	2.63	2.47	2.31	2.17
8.2	2.91	2.73	2.56	2.40	2.25	2.11	1.98	1.85
8.3	2.47	2.32	2.18	2.04	1.91	1.79	1.68	1.58
8.4	2.09	1.96	1.84	1.73	1.62	1.52	1.42	1.33
8.5	1.77	1.66	1.55	1.46	1.37	1.28	1.20	1.13
8.6	1.49	1.40	1.31	1.23	1.15	1.08	1.01	0.951
8.7	1.26	1.18	1.11	1.04	0.976	0.915	0.858	0.805
8.8	1.07	1.01	0.944	0.885	0.829	0.778	0.729	0.684
8.9	0.917	0.860	0.806	0.456	0.709	0.664	0.623	0.584
9.0	0.790	0.740	0.694	0.651	0.610	0.572	0.536	0.503

*Early life stage absent criteria will apply to all Kansas surface waters during the months November through February except in surface water segments listed in Table 1f. The application of early life stage absent criteria outside of the months November through February shall require a segment-specific examination of the surface water for the presence of early life stages of fish.

** At 15° C and above, the criterion for early life stages absent is equivalent to the criterion for early life stages present.

Table 1f. Surface Water Segments where early life stages absent chronic aquatic life criteria are not applicable.				
Surface Water	Basin	Subbasin	Hydrologic Unit Code	Segment Number
Kansas River	Kansas Lower Republican	Lower Kansas	10270104	1
Kansas River	Kansas Lower Republican	Lower Kansas	10270104	2
Kansas River	Kansas Lower Republican	Lower Kansas	10270104	3
Kansas River	Kansas Lower Republican	Lower Kansas	10270104	4
Kansas River	Kansas Lower Republican	Lower Kansas	10270104	5
Kansas River	Kansas Lower Republican	Lower Kansas	10270104	18
Kansas River	Kansas Lower Republican	Lower Kansas	10270104	19
Kansas River	Kansas Lower Republican	Lower Kansas	10270104	21 From Bowersock dam east to segment 19
Missouri River	Missouri	Tarkio-Wolf	10240005	1
Missouri River	Missouri	Tarkio-Wolf	10240005	2
Missouri River	Missouri	Tarkio-Wolf	10240005	19
Missouri River	Missouri	Tarkio-Wolf	10240005	20
Missouri River	Missouri	Tarkio-Wolf	10240005	21
Missouri River	Missouri	Independence-Sugar	10240011	1
Missouri River	Missouri	Independence-Sugar	10240011	2
Missouri River	Missouri	Independence-Sugar	10240011	4
Missouri River	Missouri	Independence-Sugar	10240011	5
Missouri River	Missouri	Independence-Sugar	10240011	7
Missouri River	Missouri	Independence-Sugar	10240011	9
Missouri River	Missouri	Independence-Sugar	10240011	11
Missouri River	Missouri	Independence-Sugar	10240011	13
Missouri River	Missouri	Independence-Sugar	10240011	15
Missouri River	Missouri	Independence-Sugar	10240011	19

(Authorized by K.S.A. ~~2000 Supp. 65-171d~~, and K.S.A. 65-171m, and K.S.A. 2002 Supp. 82a-2001, as amended by 2003 Sen. Subst. for Subst. HB 2119, Sec. 1; implementing K.S.A. ~~2001 Supp. 65-165~~, and 65-171d, K.S.A. 65-171m, and K.S.A. ~~2001~~ 2002 Supp. 82a-2001, as amended by 2003 Sen.

Subst. for Subst. HB 2119, Sec. 1, and 2003 Sen. Subst. for Subst. HB 2119, Sec. 2; effective May 1, 1986; amended, T-87-8, May 1, 1986; amended May 1, 1987; amended Aug. 29, 1994; amended July 30, 1999; amended Nov. 3, 2000; amended Aug. 31, 2001; amended Jan. 3, 2003; amended P-
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